corolla. One fly twisted his head off in the attempt to get away. Many small bees got caught, and mosquitoes too, quite often two to a flower. They are held by the tongue or the legs. Honey bees are large enough to escape or pull out. He could not discover that the capturing of flies or bees was of any advantage to the plant.

HOW THE SEEDS OF STIPA ARE PLANTED BY NATURE.—JESSE J. BEAL dropped about 20 fruits of *Stipa spartea* on a box of sand. The fruit has a long awn which is straight when wet and twisted when dry. Half the grains were dropped on sand where straws were stuck in every inch or so in every direction, the other half were dropped on sand without any straws or other objects on the surface. The grains were each held by the tip of the awn about as high as the plant grows, and each went down like an arrow, large end first, and all stuck in the sand but one. They were alternately wet and dried by sun and rain. They all bored into the sand except one. They went down just as well where there were no straws as where there were straws.

FLOWERING OF TIMOTHY.—E. C. BANK observed in cool damp weather, beginning June 29th, that a spike of timothy (*Phleum pratense*) put forth flowers (stamens) for ten days in succession, except none on the ninth day. In another place, in warmer weather, beginning July 15th, spikes put forth stamens for eleven days. Most flowers appear during a few days of the middle of these periods.

THE CLIMBING OF THE WILD MORNING GLORY.—E. T. GARDNER observed the wild morning glory (*Calystegia sepium*) and as in former years some dozen specimens were found twining the wrong way, following the course of the sun. A smooth post two inches in diameter was about as large as the vine would ascend.

Structure and Growth of the Cell Wall.

Prof. E. Strasburger's most recent publication is a work of 264 pp. entitled, "Ueber den Bau und das Wachsthum der Zellhaute" (On the Structure and Growth of the Cell-Wall). The book contains some most interesting contributions to our knowledge of the origin and growth of the cell-wall and starch grains, the function of the nucleus and the assimilation of carbon, and, based upon our previous knowledge and the author's investigations, offers some important theories in regard to the molecular structure of organized bodies.

So worthy of notice are some of the results at which he has arrived that we reproduce from the *Jour. Roy. Mic. Soc.* a summary of the salient points of the book, as follows:

With regard to the intimate structure of organized bodies, Prof. Strasburger entirely dissents from Naegeli's micellar hypothesis. This hypothesis was based upon the phenomena of "swelling up" which are so characteristic of organized bodies, and upon the optical properties which certain of these bodies possess. Prof. Strasburger points out that swelling up may be as well ascribed to the taking up of water between the molecules of the body as to its being taken up between Naegeli's micellae. He shows also that the double refraction of organized bodies, such as cell-walls, and starch grains, depends upon their organization as a whole; for when once their organization is destroyed, their double refraction is lost, a result which cannot be explained on the micellar theory, since the particles of the disintegrated micellae would, like particles of broken crystals, still retain their power of double refraction.

According to Strasburger the molecules of an organized body are not aggregated into micellae which are held together by attraction, but are linked together, probably by means of multivalent atoms, by chemical affinity, in a reticulate manner. Swelling up is then the expression of the taking up of water into the meshes of the molecular reticulum, where it is retained by the intermolecular capillarity. The more extensible the reticulum, that is, the more mobile the groups of molecules within their position of equilibrium, the greater the amount of swelling up. The limit is reached when the chemical affinity of the molecules and the force of the intermolecular capillarity are equal; if the latter exceed the former at any moment, the result is the destruction of the molecular reticulum, or, in other words, of the organization. Protoplasm differs from other organized bodies in that the grouping of its molecules is undergoing perpetual change, the result of this molecular activity being the phenomena which we term vital. The growth in thickness of cell-walls and starch grains takes place, according to Prof. Strasburger, by the deposition of successive layers; in opposition to Naegeli's view, that the mode of growth was intussusceptive, with subsequent differentiation of layers. Even the surface growth of cell-walls is not, in his opinion, intussusceptive, but is merely due to stretching.

With reference to the mode of formation of the cell-wall and of the thickening layers, Strasburger agrees with the view of Schmitz that the cell-wall is formed by the actual conversion of a layer of the protoplasm, that is, chemically speaking, by the production of a layer of cellulose from a layer of proteid. When a mass of protoplasm is about to clothe itself with a membrane, the peripheral layer becomes densely filled with minute proteid bodies, the microsomata, and this layer then becomes converted into cellulose. The wall of a young wood-cell of *Pinus*, for instance, is clothed internally with a layer of protoplasm filled with microsomata, which are arranged in spiral rows; the microsomata then gradually disappear and the layer of protoplasm is found to be replaced by a layer of cellulose, which presents spiral striation corresponding to the previously existing rows of microsomata, and which constitutes a thickening layer of the cell-wall. In cells the walls of which become much thickened, the whole of the protoplasm may be gradually used up in this way. Again, the wall of pollen-grains and of spores is formed from a peripheral layer of the protoplasm which contains abundant microsomata. Its subsequent growth, and especially the development of the asperitus which it commonly presents, is effected by the surrounding protoplasm which is derived from disorganized tapetal cells ; this is especially well shown in the development of the epispore of *Equisetum* and of *Marsilia*. When an intine or endospore is present it is produced like the outer coat from a peripheral layer of the protoplasm of the pollen-grain or spore. Further, the septum which is formed in the division of a cell is produced in the same way.

The cell plate, like the peripheral layer of the protoplasm of a young pollen grain, contains microsomata which disappear, and it is then converted into a plate of cellulose. Finally, the successive layers of a starch grain are produced by the alteration into starch of layers of proteid-substance derived from the starch-forming corpuscle (amyloplast).

Professor Strasburger next points out that the starch which makes its appearance in the chlorophyll-corpuscles under the influence of light, is derived from the proteid of the corpuscles by dissociation. The formation of this starch is therefore not the immediate product of the synthetic processes going on in the chlorophyll-corpuscles, but only a secondary product. The processes in question produce proteid. Prof. Strasburger is inclined to accept Erlen Meyer's hypothesis that methyl aldehyde is formed in the chlorophyll-corpuscles from carbon dioxide and water, and to believe that by polymerization a substance is produced which can combine with the nitrogenous residues of previous dissociations of proteid to reconstruct proteid. He does not agree with the suggestion of Loew and Bokorny that the methyl aldehyde may conbine with ammonia and sulphur to form proteid *de novo*.

Lastly, Prof. Strasburger makes a suggestion as to the probable physiological significance of the nucleus. He points out that the nucleus cannot be regarded as regulating cell-divisions ; for instances are known of cell-division taking place without previous nuclear divisions, and conversely, of nuclear-division taking place without cell-division. He is of opinion that the nucleus plays an important part in the formation of proteid in the cell. This view is founded upon the fact that one or more nuclei have been found to be present in the vast majority of plant-cells, that the nucleus is, as a general rule, the most persistent protoplasmic structure, and that it gives the various proteid reactions in a very marked manner.